PB-250 691

CHATUGE LAKE, TOWNS COUNTY, GEORGIA AND CLAY COUNTY, NORTH CAROLINA

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center

June 1975

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

PB 250 691

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LABORATORY

An Associate Laboratory of the

NATIONAL ENVIRONMENTAL RESEARCH CENTER - CORVALLIS, OREGON

and

NATIONAL ENVIRONMENTAL RESEARCH CENTER - LAS VEGAS, NEVADA

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

☆GPO—697-092

53

083032

REPORT
ON
CHATUGE LAKE
TOWNS COUNTY, GEORGIA AND
CLAY COUNTY, NORTH CAROLINA
EPA REGION IV
WORKING PAPER No. 286

WITH THE COOPERATION OF THE
GEORGIA DEPARTMENT OF NATURAL RESOURCES
AND THE
GEORGIA NATIONAL GUARD
JUNE, 1975

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.
3. RECIPIENT'S ACCESSION NO.	PB250691
4. TITLE AND SUBTITLE	Report on Chatuge Lake, Towns County, Georgia and Clay County, North Carolina
5. REPORT DATE	Prepared June 1975
6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S)	Anonymous (National Eutrophication Survey Staff)
8. PERFORMING ORGANIZATION REPORT NO.	Working Paper # 286
9. PERFORMING ORGANIZATION NAME AND ADDRESS	Pacific Northwest Environmental Research Laboratory U.S.Environmental Protection Agency 200 S. W. 35th St. Corvallis, Oregon 97330
10. PROGRAM ELEMENT NO.	1BA029
11. CONTRACT/GRANT NO.	
12. SPONSORING AGENCY NAME AND ADDRESS	Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460
13. TYPE OF REPORT AND PERIOD COVERED	Final - 1972
14. SPONSORING AGENCY CODE	
15. SUPPLEMENTARY NOTES	Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

Reproduced from best available copy.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN-ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

PRICES SUBJECT TO CHANGE

18. DISTRIBUTION STATEMENT: Release unlimited	19. SECURITY CLASS (This Report)	21. NO. OF PAGES: 53
	20. SECURITY CLASS (This page)	22. PRICE: $4.50 - 2.25

ia

CONTENTS

	Page
Foreword	ii
List of Georgia Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	11
V. Literature Reviewed	16
VI. Appendices	17

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Georgia Department of Natural Resources for professional involvement and to the Georgia National Guard for conducting the tributary sampling phase of the Survey.

Joe D. Tanner, Commissioner of the Department of Natural Resources; J. Leonard Ledbetter, Director of the Environmental Protection Division; Ralph S. Howard, Jr., Environmental Affairs Coordinator; Gene B. Welsh, Chief of the Water Protection Branch; Edward T. Hall, Jr., Unit Coordinator; and Broughton A. Caldwell, R. Marshall Gaddis, William D. Kennedy, and Kenneth W. Martin, Environmental Specialists, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary lake reports, and provided critiques most useful in the preparation of this Working Paper series.

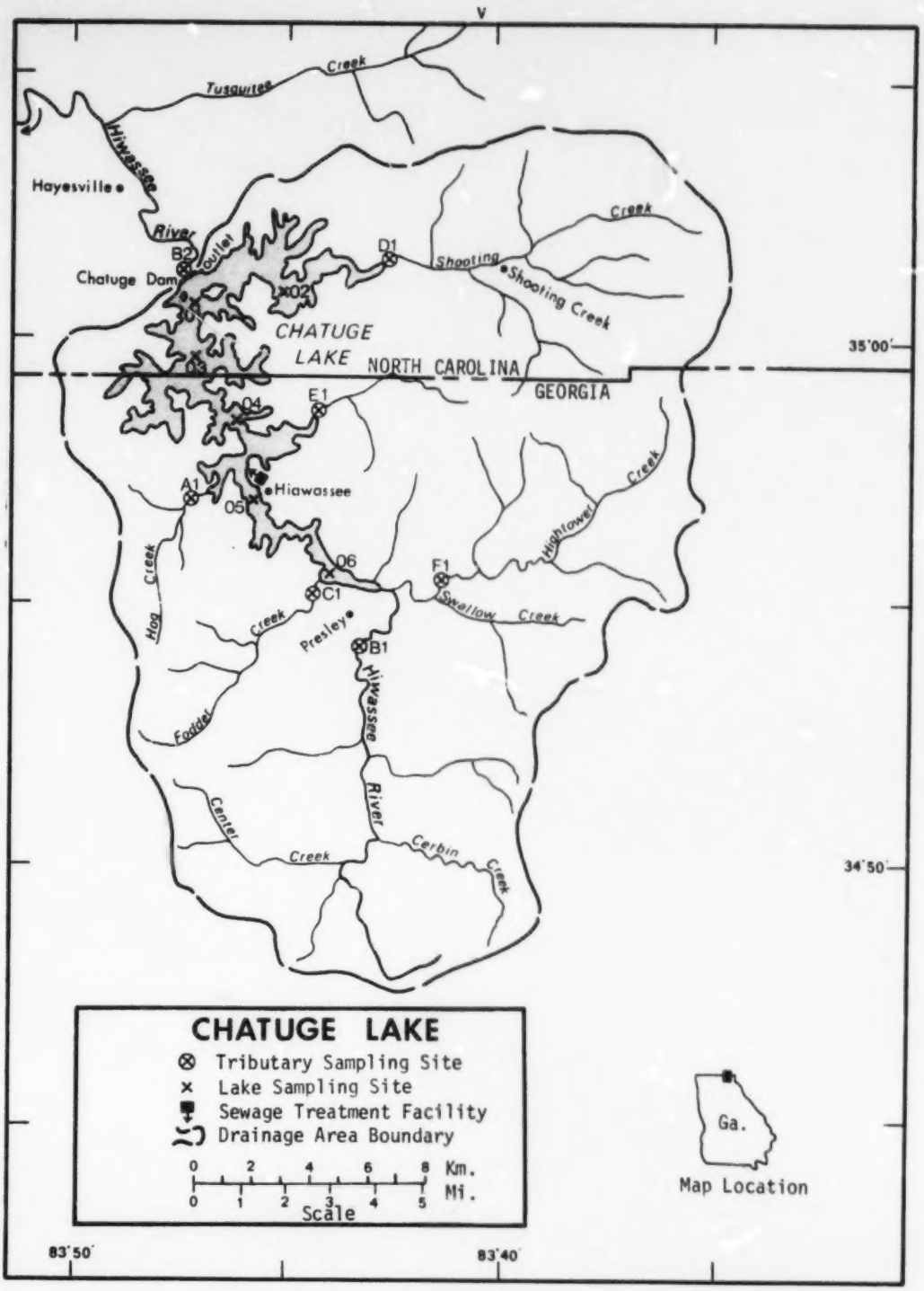
Major General Joel B. Paris, III, then the Adjutant General of Georgia, and Project Officer Lt. Colonel John R. Ranier, who directed the volunteer efforts of the Georgia National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF GEORGIA

LAKE NAME	COUNTY
Allatoona	Bartow, Cherokee, Cobb
Blackshear	Crisp, Dooly, Lee, Sumpter, Worth
Blue Ridge	Fannin
Burton	Rabun
Chatuge	Towns, GA; Clay, NC
Clark Hill	Columbia, Elbert, Lincoln, McDuffie, Wilks, GA; Abbeville, McCormick, SC
Harding	Harris, GA; Chambers, Lee, AL
Hartwell	Franklin, Hart, Stephens, GA; Anderson, Oconee, Pickens, SC
High Falls	Butts, Lamar, Monroe
Jackson	Butts, Jasper, Newton
Nottely	Union
Seminole	Decatur, Seminole, GA; Jackson, FL
Sidney Lanier	Dawson, Forsyth, Gwinnett, Hall, Lumpkin
Sinclair	Baldwin, Hancock, Putnam
Walter F. George	Clay, Quitman, Stewart, GA; Barbour, Henry, Russell, AL


Tusquitee Creek
Hiwassee River
Hayesville
Chatuge Dam
Outlet
B2
D1
Shooting Creek
Shooting Creek
CHATUGE LAKE
NORTH CAROLINA
GEORGIA
35°00'
E1
Hiawassee
A1
05
Hog Creek
Creek
Highlower Creek
06
C1
F1
Swallow Creek
Presley
B1
Hiwassee River
Fodder
Center Creek
Cerbin Creek
34°50'
CHATUGE LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 2 4 6 8 Km.
0 1 2 3 4 5 Mi.
Scale
Ga.
Map Location
83°50'
83°40'

CHATUGE LAKE*

STORET NO. 1303

I. CONCLUSIONS

A. Trophic Condition:

Survey data show that Chatuge Lake is mesotrophic. Of the 14 lakes and reservoirs sampled in Georgia, Chatuge Lake ranked third using a combination of six parameters as an index to overall quality**. Two of the lakes had less median total phosphorus, four had less and two had the same median dissolved phosphorus, two had less median inorganic nitrogen, four had less mean chlorophyll a, and only one had a greater mean Secchi disc transparency.

During their visits to the lake, Survey limnologists did not observe any nuisance conditions. However, dissolved oxygen was depressed with depth (at and below 5 to 6 meters) at all sampling stations in June and was essentially depleted below 9 meters at stations 1, 2, 3, and 4 in September.

B. Rate-Limiting Nutrient:

The algal assay results indicate Chatuge Lake was phosphorus limited at the time the assay sample was collected. Lake data also indicate phosphorus limitation for the June, 1973, sampling as well as the September, 1973, sampling (i.e., the mean N/P ratios were 19/1 and greater, and phosphorus limitation would be expected). However, the November, 1973, lake sampling data

---

* Table of metric conversions--Appendix A.
** See Appendix B.

indicate a nitrogen limited condition (i.e., the mean N/P ratio was 8/1, and nitrogen limitation would be expected).

C. Nutrient Controllability:

1. Point sources--The phosphorus load from the only known point source was 4.2% of the total reaching the lake during the sampling year. Phosphorus reduction at the Hiawassee wastewater treatment plant would not appreciably change the loading rate of 0.39 $g/m^2/yr$ (see page 15). However, any future increase in point-source loading should be carefully evaluated due to the existing high quality of Chatuge Lake.

2. Non-point sources--The phosphorus loads from non-point sources accounted for 95.8% of the total reaching the lake during the sampling year. The gaged tributaries contributed a total of 74.8% and ranged from 24.6% (Hiwassee River) to 3.6% (Fodder Creek). The ungaged tributaries were estimated to have contributed 16.4% of the total.

The phosphorus export rates of the sampled tributaries ranged from 15 to 25 $kg/km^2/yr$ with a mean of 22 $kg/km^2/yr$ (see page 15). These rates compare well with the export rates of tributaries to nearby Blue Ridge Lake* (mean of 18 $kg/km^2/yr$) and Nottely Reservoir** (mean of 20 $kg/km^2/yr$).

* Working Paper No. 284.
** Working Paper NO. 291.

In a recent Georgia Department of Natural Resources report (Anonymous, 1973), the Hiwassee River was classified as "healthy" at a station two miles upstream from Chatuge Lake; nutrient concentrations at that time (08/10/72) were very low (NO_2 + NO_3 = 0.050 mg/l, NH_3 = <0.020 mg/l, and P = <0.020 mg/l). On 08/05/73, Survey concentrations at the same place were quite comparable (NO_2 + NO_3 = 0.115 mg/l, NH_3 = 0.013 mg/l, and total P = 0.015 mg/l).

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 28.94 kilometers^2.
2. Mean depth: 10.6 meters.
3. Maximum depth: 36.9 meters.
4. Volume: 306.764 x 10^6 m^3.
5. Mean hydraulic retention time: 296 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Hiwassee River	119.1	3.8
Hog Creek	15.3	0.4
Fodder Creek	28.0	0.6
Shooting Creek	98.4	2.5
Bell Creek	20.7	0.5
Hightower Creek	85.0	2.1
Minor tributaries & immediate drainage -	94.0	2.1
Totals	460.5	12.0

2. Outlet -

Hiwassee River	489.5**	12.0

C. Precipitation***:

1. Year of sampling: 194.4 centimeters.
2. Mean annual: 125.4 centimeters.

---

† Hall, 1974.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Chatuge Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from six stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 meters or near bottom to surface) sample was composited from the six stations for phytoplankton identification and enumeration; and during the first visit (June, 1973), two 18.9-liter depth-integrated samples were composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 31.7 meters at station 1, 20.1 meters at station 2, 30.5 meters at station 3, 24.4 meters at station 4, 13.7 meters at station 5, and 5.2 meters at station 6.

The results obtained are presented in full in Appendix D, and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR CHATUGE LAKE
STORET CODE 1303

PARAMETER	1ST SAMPLING (6/29/73) 6 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/12/73) 6 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (11/10/73) 6 SITES RANGE	MEAN	MEDIAN
TEMP (C)	13.2 - 27.0	21.4	22.1	16.9 - 27.7	23.1	23.5	12.7 - 15.8	15.0	15.4
DISS OXY (MG/L)	2.6 - 12.4	6.9	6.9	0.1 - 8.2	4.2	4.2	5.4 - 9.4	7.8	8.0
CNDCTVY (MCROMO)	50. - 50.	50.	50.	15. - 38.	23.	23.	15. - 21.	19.	20.
PH (STAND UNITS)	5.9 - 8.5	6.8	6.9	5.5 - 6.9	6.0	6.0	6.2 - 7.3	6.5	6.4
TOT ALK (MG/L)	10. - 10.	10.	10.	10. - 14.	11.	10.	10. - 10.	10.	10.
TOT P (MG/L)	0.007 - 0.070	0.014	0.012	0.005 - 0.027	0.018	0.021	0.010 - 0.049	0.017	0.015
ORTHO P (MG/L)	0.002 - 0.005	0.003	0.002	0.004 - 0.011	0.006	0.006	0.006 - 0.018	0.013	0.013
NO2+NO3 (MG/L)	0.040 - 0.190	0.097	0.080	0.020 - 0.140	0.054	0.030	0.030 - 0.050	0.036	0.035
AMMONIA (MG/L)	0.030 - 0.250	0.091	0.070	0.020 - 0.200	0.058	0.040	0.040 - 0.130	0.069	0.070
KJEL N (MG/L)	0.200 - 0.900	0.303	0.300	0.200 - 0.600	0.289	0.200	0.200 - 0.300	0.207	0.200
INORG N (MG/L)	0.080 - 0.380	0.178	0.155	0.040 - 0.230	0.112	0.090	0.070 - 0.170	0.104	0.100
TOTAL N (MG/L)	0.240 - 0.940	0.400	0.360	0.220 - 0.630	0.342	0.330	0.230 - 0.350	0.243	0.235
CHLRPYL A (UG/L)	2.5 - 15.3	6.6	5.4	4.7 - 6.6	5.8	6.0	2.9 - 15.9	6.6	5.0
SECCHI (METERS)	2.4 - 5.9	4.4	4.7	1.6 - 5.0	3.1	2.7	1.2 - 1.8	1.5	1.4

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
06/29/73	1. Oscillatoria	322
	2. Dinoflagellates	231
	3. Tabellaria	131
	4. Asterionella	70
	5. Roya (?)	70
	Other genera	261
	Total	1,085
09/12/73 (stations 1, 2, & 3)	1. Lyngbya	1,859
	2. Chroococcus	1,180
	3. Tabellaria	400
	4. Aphanizomenon	140
	5. Aphanocapsa	140
	Other genera	479
	Total	4,198
09/12/73 (stations 4, 5, & 6)	1. Lyngbya	1,935
	2. Tabellaria	630
	3. Aphanizomenon	557
	4. Melosira	235
	5. Chlamydomonas	117
	Other genera	381
	Total	3,855
11/10/73	1. Anabaena	303
	2. Melosira	288
	3. Centric diatoms	80
	4. Peridinium	32
	5. Dinobryon	32
	Other genera	95
	Total	830

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
06/29 or 30/73	01	15.3
	02	3.8
	03	5.1
	04	4.0
	05	7.1
	06	2.5
09/12 or 17/73	01	6.6
	02	6.3
	03	5.9
	04	5.2
	05	6.1
	06	4.7
11/10/73	01	15.9
	02	3.6
	03	2.9
	04	3.9
	05	6.2
	06	7.0

C. Limiting Nutrient Study:

1. Stations 1, 2, and 3 -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.013	0.176	0.1
0.010 P	0.023	0.176	0.1
0.020 P	0.033	0.176	1.1
0.050 P	0.063	0.176	1.2
0.025 P + 0.5 N	0.038	0.676	2.5
0.050 P + 1.0 N	0.063	1.176	12.0
1.0 N	0.013	1.176	0.1

b. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.007	0.129	0.1
0.010 P	0.017	0.129	0.3
0.020 P	0.027	0.129	1.0
0.050 P	0.057	0.129	1.8
0.025 P + 0.5 N	0.032	0.629	1.9
0.050 P + 1.0 N	0.057	1.129	10.3
1.0 N	0.007	1.129	0.1

2. Stations 4, 5, and 6 -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.010	0.173	0.1
0.010 P	0.020	0.173	0.2
0.020 P	0.030	0.173	0.4
0.050 P	0.060	0.173	2.2
0.025 P + 0.5 N	0.035	0.673	5.1
0.050 P + 1.0 N	0.060	1.173	15.7
1.0 N	0.010	1.173	0.1

b. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.004	0.114	0.1
0.010 P	0.014	0.114	0.2
0.020 P	0.024	0.114	0.9
0.050 P	0.054	0.114	1.3
0.025 P + 0.5 N	0.029	0.614	3.1
0.050 P + 1.0 N	0.054	1.114	8.1
1.0 N	0.004	1.114	0.1

3. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Chatuge Lake was low at the time of sample collection. Both assays, filtered only and autoclaved-filtered, demonstrated increasing yields with increasing concentrations of orthophosphorus indicating that this lake was limited by phosphorus at that time. Note that the addition of only nitrogen resulted in yields not significantly different from those of the controls.

The lake data also indicate Chatuge Lake was phosphorus limited at the time the algal assay sample was collected (June, 1973); the mean ratio of inorganic nitrogen to dissolved phosphorus was greater than 50/1. Lake data also indicate a phosphorus limited condition during the September, 1973, sampling. However, the lake data indicate nitrogen limitation during the November, 1973, sampling; the mean N/P ratio was 8/1, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Georgia National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of January and February when two samples were collected. Sampling was begun in March, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Georgia District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were calculated from mean annual concentrations and mean annual flows. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the mean concentrations at stations A-1, B-1, C-1, D-1, E-1, and F-1 and the mean annual ZZ flow.

The City of Hiawassee did not participate in the Survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Hiawassee	405	act. sludge	189.25	Chatuge Lake

2. Known industrial** - None

* Nations, 1973.
** Anonymous, 1972.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Hiwassee River	2,720	24.0
Hog Creek	315	2.8
Fodder Creek	410	3.6
Shooting Creek	2,320	20.5
Bell Creek	490	4.3
Hightower Creek	2,160	19.1
b. Minor tributaries & immediate drainage (non-point load) -	1,870	16.5
c. Known municipal -		
Hiawassee	460	4.1
d. Septic tanks* -	70	0.6
e. Known industrial - None	-	-
f. Direct precipitation** -	505	4.5
Total	11,320	100.0

2. Outputs -

Lake outlet - Hiwassee River 8,000

3. Net annual P accumulation - 3,320 kg.

* Estimate based on 250 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Hiwassee River	67,735	25.6
Hog Creek	5,195	2.0
Fodder Creek	9,405	3.6
Shooting Creek	59,020	22.3
Bell Creek	10,180	3.8
Hightower Creek	38,880	14.7
b. Minor tributaries & immediate drainage (non-point load) -	38,850	14.7
c. Known municipal -		
Hiawassee	1,375	0.5
d. Septic tanks* -	2,665	1.0
e. Known industrial - None	-	-
f. Direct precipitation** -	31,240	11.9
Total	264,545	100.0

2. Outputs -

Lake outlet - Hiwassee River 188,910

3. Net annual N accumulation - 75,635 kg.

* Estimate based on 250 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Hiwassee River	23	569
Hog Creek	21	340
Fodder Creek	15	336
Shooting Creek	24	600
Bell Creek	24	492
Hightower Creek	25	457

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	0.39	0.11	9.1	2.6

Vollenweider loading rates for phosphorus (g/m²/yr) based on mean depth and mean hydraulic retention time of Chatuge Lake:

"Dangerous" (eutrophic rate)	0.70
"Permissible" (oligotrophic rate)	0.35

V. LITERATURE REVIEWED

Anonymous, 1972. Georgia municipal and industrial wastewater treatment facilities associated with reservoirs. GA Dept. of Nat. Resources, Atlanta.

Anonymous, 1973. Water quality investigation of the Tennessee River basin in Georgia. GA Dept. of Nat. Resources, Atlanta.

Anonymous, 1974. Water quality monitoring data for Georgia streams, 1973; volume 3. GA Dept. of Nat. Resources, Atlanta.

Hall, Edward T., 1974. Personal communication (lake morphometry). GA Dept. of Nat. Resources, Atlanta.

Nations, Carlos (Supt.), 1973. Treatment plant questionnaire (Hiawassee STP). Hiawassee, GA.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VII. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

LAKE RANKINGS

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1316	BLUE RIDGE LAKE	524
2	1318	BURTON LAKE	523
3	1303	CHATUGE LAKE	424
4	1311	NOTTELY RESERVOIR	393
5	1310	LAKE SIDNEY LANIER	385
6	1304	CLARK HILL RESERVOIR	309
7	1301	ALLATOONA RESERVOIR	286
8	1302	BLACKSHEAR LAKE	284
9	1313	SINCLAIR LAKE	254
10	1312	LAKE SEMINOLE	253
11	1319	HIGH FALLS LAKE,	192
12	1314	LAKE EUFAULA	184
13	1309	JACKSON LAKE	116
14	1317	LAKE HARDING	77

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS P	INDEX NO
1301	ALLATOONA RESERVOIR	62 (8)	54 (7)	46 (6)	31 (4)	31 (0)	62 (7)	286
1302	BLACKSHEAR LAKE	38 (5)	31 (4)	0 (0)	100 (13)	100 (13)	15 (2)	284
1303	CHATUGE LAKE	85 (11)	85 (11)	92 (12)	69 (9)	31 (0)	62 (7)	424
1304	CLARK HILL RESERVOIR	54 (7)	62 (8)	62 (8)	54 (7)	31 (0)	46 (6)	309
1309	JACKSON LAKE	8 (1)	8 (1)	15 (2)	8 (1)	69 (9)	8 (1)	116
1310	LAKE SIDNEY LANIER	69 (9)	46 (6)	77 (10)	77 (10)	31 (0)	85 (10)	385
1311	NOTTELY RESERVOIR	77 (10)	69 (9)	69 (9)	62 (8)	31 (0)	85 (10)	393
1312	LAKE SEMINOLE	31 (4)	15 (2)	38 (5)	46 (6)	92 (12)	31 (4)	253
1313	SINCLAIR LAKE	46 (6)	38 (5)	54 (7)	23 (3)	31 (0)	62 (7)	254
1314	LAKE EUFAULA	15 (2)	23 (3)	31 (4)	15 (2)	77 (10)	23 (3)	184
1316	BLUE RIDGE LAKE	92 (12)	92 (12)	85 (11)	85 (11)	85 (11)	85 (10)	524
1317	LAKE HARDING	0 (0)	0 (0)	8 (1)	38 (5)	31 (0)	0 (0)	77
1318	BURTON LAKE	100 (13)	100 (13)	100 (13)	92 (12)	31 (0)	100 (13)	523
1319	HIGH FALLS LAKE	23 (3)	77 (10)	23 (3)	0 (0)	31 (0)	38 (5)	192

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS P
1301	ALLATOONA RESERVOIR	0.020	0.150	443.167	7.489	14.900	0.005
1302	BLACKSHEAR LAKE	0.035	0.250	468.091	1.855	11.700	0.014
1303	CHATUGE LAKE	0.014	0.110	382.778	6.339	14.900	0.005
1304	CLARK HILL RESERVOIR	0.024	0.150	439.250	6.715	14.900	0.007
1309	JACKSON LAKE	0.094	0.530	461.385	14.577	14.800	0.027
1310	LAKE SIDNEY LANIER	0.016	0.180	396.417	5.431	14.900	0.004
1311	NOTTELY RESERVOIR	0.015	0.130	405.667	6.656	14.900	0.004
1312	LAKE SEMINOLE	0.040	0.405	456.133	6.760	11.800	0.010
1313	SINCLAIR LAKE	0.028	0.230	440.667	8.006	14.900	0.005
1314	LAKE EUFAULA	0.048	0.345	457.667	9.083	14.400	0.011
1316	BLUE RIDGE LAKE	0.010	0.105	394.889	3.078	13.000	0.004
1317	LAKE HARDING	0.114	0.640	467.538	7.438	14.900	0.045
1318	BURTON LAKE	0.007	0.100	363.889	2.733	14.900	0.003
1319	HIGH FALLS LAKE	0.047	0.115	459.444	15.075	14.900	0.009

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR GEORGIA 12/2/75

LAKE CODE 1303 CHATUGE LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 489.5

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1303A1	15.3	0.51	0.51	0.57	0.51	0.42	0.28	0.31	0.25	0.20	0.14	0.17	0.42	0.36
1303B1	119.1	4.62	5.72	6.20	5.66	4.28	3.31	2.66	2.44	2.04	2.10	2.63	3.54	3.75
1303B2	489.5	9.88	10.08	7.67	14.10	13.93	17.41	17.58	17.50	14.95	5.86	4.76	11.13	12.08
1303C1	28.0	0.93	0.93	0.99	0.93	0.76	0.54	0.54	0.42	0.37	0.28	0.31	0.76	0.65
1303D1	98.4	3.48	4.30	4.25	3.77	2.66	2.18	1.81	1.61	1.22	1.22	1.61	2.44	2.54
1303E1	20.7	0.68	0.68	0.71	0.68	0.54	0.40	0.40	0.31	0.28	0.20	0.23	0.57	0.47
1303F1	85.0	2.63	3.28	3.48	3.23	2.46	1.90	1.53	1.39	1.16	1.19	1.53	2.04	2.14
1303ZZ	94.0	3.03	3.06	3.26	3.03	2.49	1.73	1.81	1.44	1.25	0.88	1.08	2.49	2.12

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 489.5
SUM OF SUB-DRAINAGE AREAS = 460.5
TOTAL FLOW IN = 144.87
TOTAL FLOW OUT = 144.87

NOTE *** LAKE AREA=11.2 SQ MI, NOT INCLUDED IN SUMS OF SUB-DRAINAGE AREAS

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1303A1	3	73	0.88	10	0.71				
	4	73	0.74	14	0.59				
	5	73	1.05	12	0.79				
	6	73	0.68	9	1.19				
	7	73	0.48	14	0.34				
	8	73	0.34	5	0.21				
	9	73	0.22	9	0.14				
	10	73	0.11	6	0.12				
	11	73	0.22	10	0.09				
	12	73	0.93	8	0.68				
	1	74	1.16	5	1.44	19	0.91		
	2	74	0.93	2	3.26	16	1.00		
1303B1	3	73	9.63	10	7.02				
	4	73	8.30	14	6.09				
	5	73	10.42	12	7.56				
	6	73	8.07	9	10.25				
	7	73	3.99	14	4.02				
	8	73	3.28	5	2.80				
	9	73	2.21	9	2.12				
	10	73	1.61	6	1.81				
	11	73	3.31	10	1.47				
	12	73	7.82	8	6.68				
	1	74	10.51	5	11.75	19	8.21		
	2	74	10.36	2	21.29	16	9.40		

TRIBUTARY FLOW INFORMATION FOR GEORGIA 12/2/75

LAKE CODE 1303 CHATUGE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
130302	3	73	12.06	10	11.95				
	4	73	9.23	14	8.40				
	5	73	25.94	12	23.64				
	6	73	23.59	9	24.21				
	7	73	15.74	14	2.35				
	8	73	16.23	5	8.40				
	9	73	15.46	9	19.23				
	10	73	8.72	6	8.38				
	11	73	15.55	10	10.62				
	12	73	26.25	8	24.24				
	1	74	35.68	5	27.75	19	42.19		
	2	74	32.56	2	26.11	16	37.38		
1303C1	3	73	1.53	10	1.19				
	4	73	1.36	14	1.05				
	5	73	1.87	12	1.27				
	6	73	1.30	9	1.67				
	7	73	2.81	14	1.82				
	8	73	0.57	5	0.54				
	9	73	0.48	9	0.48				
	10	73	0.23	6	0.37				
	11	73	0.40	10	0.28				
	12	73	1.70	8	1.13				
	1	74	2.12	5	1.93	19	1.36		
	2	74	1.70	2	3.26	16	1.56		
130301	3	73	6.57	10	5.10				
	4	73	5.49	14	4.25				
	5	73	6.48	12	5.66				
	6	73	5.32	9	7.36				
	7	73	2.72	14	2.58				
	8	73	2.18	5	1.64				
	9	73	1.33	9	1.16				
	10	73	1.22	6	0.96				
	11	73	2.04	10	0.74				
	12	73	5.38	8	4.81				
	1	74	7.93	5	9.34	19	6.23		
	2	74	7.79	2	19.54	16	7.22		
1303E1	3	73	1.10	10	0.91				
	4	73	0.99	14	0.79				
	5	73	1.30	12	1.02				
	6	73	0.96	9	1.42				
	7	73	0.59	14	0.51				
	8	73	0.42	5	0.31				
	9	73	0.31	9	0.23				
	10	73	0.15	6	0.19				
	11	73	0.28	10	0.15				
	12	73	1.25	8	0.88				
	1	74	1.56	5	1.70	19	1.10		
	2	74	1.22	2	3.40	16	1.30		

TRIBUTARY FLOW INFORMATION FOR GEORGIA 12/2/75

LAKE CODE 1303 CHATUGE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1303F1	3	73	5.41	10	3.96				
	4	73	4.70	14	3.40				
	5	73	6.00	12	4.25				
	6	73	4.62	9	5.52				
	7	73	2.29	14	2.35				
	8	73	1.87	5	1.64				
	9	73	1.27	9	1.27				
	10	73	0.91	6	1.10				
	11	73	1.93	10	0.91				
	12	73	4.50	8	3.68				
	1	74	6.00	5	6.37	19	4.53		
	2	74	5.95	2	11.33	16	5.24		
1303ZZ	3	73	5.04						
	4	73	4.42						
	5	73	6.09						
	6	73	4.22						
	7	73	2.72						
	8	73	1.95						
	9	73	1.36						
	10	73	0.68						
	11	73	1.36						
	12	73	5.49						
	1	74	6.91						
	2	74	5.52						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/11/26

130301
35 00 43.0 083 47 10.0
CHATUGE LAKE
13 GEORGIA

11EPALES 2111202
3 0105 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/29	10 30	0000	26.6		216	50K	6.20	10K	0.060	0.900	0.040	0.002
	10 30	0012	25.7	11.0		50K	8.30	10K	0.040	0.200K	0.040	0.003
	10 30	0015	23.0	12.4		50K	8.50	10K	0.040	0.300	0.060	0.005
	10 30	0025	19.0	6.8		50K	7.00	10K	0.060	0.400	0.060	0.003
	10 30	0040	16.6	3.6		50K	6.20	10K	0.060	0.200	0.150	0.002
	10 30	0075	13.9	6.0		50K	6.20	10K	0.070	0.200	0.160	0.003
	10 30	0100	13.2	4.6		50K	6.20	10K	0.110	0.300	0.160	0.002
73/09/12	10 25	0000	27.3		198	18	6.90	11	0.050	0.600	0.030	0.010
	10 25	0005	27.1	7.8		22	6.50	10	0.030	0.300	0.030	0.007
	10 25	0015	26.9	8.0		20	6.10	11	0.030	0.300	0.030	0.006
	10 25	0030	22.8	4.0		17	5.90	10	0.040	0.200	0.050	0.006
	10 25	0050	19.1	1.2		16	5.80	12	0.070	0.200K	0.080	0.011
	10 25	0070	17.6	1.0		15	5.50	10	0.040	0.200K	0.140	0.007
	10 25	0090	16.9	0.1		18	5.60	14	0.080	0.200K	0.100	0.005
73/11/10	09 40	0000	15.8		72	15	7.30	10K	0.090	0.300	0.050	0.018
	09 40	0010	15.7	7.8		18	7.00	10K	0.070	0.200K	0.030	0.013
	09 40	0025	15.8	7.6		18	6.90	10K	0.070	0.200K	0.030	0.014
	09 40	0050	15.8	5.4		18	6.80	10K	0.070	0.200K	0.030	0.014
	09 40	0075	15.6	7.0		18	6.70	10K	0.080	0.200K	0.030	0.015
	09 40	0104	15.0	6.2		17	6.50	10K	0.130	0.200	0.040	0.015

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

130301
35 00 43.0 083 47 10.0
CHATUGE LAKE
13 GEORGIA

11FPALES 2111202
3 0105 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/29	10 30	0000	0.012	15.3
	10 30	0012	0.011	
	10 30	0015	0.015	
	10 30	0025	0.018	
	10 30	0040	0.008	
	10 30	0075	0.007	
	10 30	0100	0.009	
73/09/12	10 25	0000	0.025	6.6
	10 25	0005	0.027	
	10 25	0015	0.024	
	10 25	0030	0.022	
	10 25	0050	0.025	
	10 25	0070	0.022	
	10 25	0090	0.023	
73/11/10	09 40	0000	0.018	15.9
	09 40	0010	0.015	
	09 40	0025	0.013	
	09 40	0050	0.013	
	09 40	0075	0.017	
	09 40	0104	0.049	

STORET RETRIEVAL DATE 74/11/26

130302
35 00 45.0 083 45 20.0
CHATUGE LAKE
13 GEORGIA

11EPALES
3

2111202
0070 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/30	10 45	0000	26.6		180	50K	7.30	10K	0.080	0.400	0.060	0.003
	10 45	0005	26.5	8.0		50K	7.40	10K	0.090	0.200K	0.070	0.002
	10 45	0012	26.4	8.0		50K	7.50	10K	0.060	0.200K	0.050	0.002
	10 45	0015	22.9	9.7		50K	7.40	10K	0.090	0.200	0.140	0.002
	10 45	0025	19.2	5.2		50K	6.40	10K	0.100	0.200K	0.140	0.002
	10 45	0045	16.1	4.9		50K	6.30	10K	0.090	0.200K	0.190	0.003
	10 45	0066	14.9	3.8		50K	6.30	10K	0.130	0.300	0.190	0.005
73/09/12	11 05	0000	27.7		108	23	6.60	13	0.030	0.200K	0.030	0.007
	11 05	0005	27.5	6.8		24	6.20	12	0.040	0.200K	0.030	0.005
	11 05	0015	26.7	8.2		23	6.00	13	0.030	0.200	0.030	0.005
	11 05	0025	23.5	4.4		21	5.70	13	0.070	0.200K	0.080	0.004
	11 05	0040	20.6	1.4		21	5.70	10K	0.080	0.200K	0.070	0.006
	11 05	0060	19.4	0.1		30	5.70	13	0.160	0.200	0.070	0.004
73/11/10	09 00	0000	15.7		48	20	6.50	10K	0.070	0.200K	0.040	0.013
	09 00	0010	15.7	7.6		21	6.40	10K	0.070	0.200K	0.040	0.014
	09 00	0025	15.7	7.6		20	6.40	10K	0.070	0.200K	0.040	0.014
	09 00	0040	15.7	8.0		20	6.50	10K	0.070	0.300	0.040	0.015
	09 00	0058	15.5	8.0		20	6.40	10K	0.070	0.200	0.040	0.014

< VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

130302
35 00 45.0 083 45 20.0
CHATUGE LAKE
13 GEORGIA

11EPALES 2111202
3 0070 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/30	10 45	0000	0.008	5.8
	10 45	0005	0.007	
	10 45	0012	0.007	
	10 45	0015	0.023	
	10 45	0025	0.013	
	10 45	0045	0.013	
	10 45	0066	0.024	
73/09/12	11 05	0000	0.021	6.3
	11 05	0005	0.022	
	11 05	0015	0.023	
	11 05	0025	0.023	
	11 05	0040	0.022	
	11 05	0060	0.022	
73/11/10	09 00	0000	0.017	3.6
	09 00	0010	0.016	
	09 00	0025	0.016	
	09 00	0040	0.016	
	09 00	0058	0.015	

STORET RETRIEVAL DATE 74/11/26

130303
34 59 43.0 083 47 06.0
CHATUGE LAKE
13 GEORGIA

11EPALES
3

2111202
0105 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/30	09	55 0000	26.4		234	50K	7.30	10K	0.100	0.400	0.060	0.004
	09	55 0005	26.4	7.8		50K	7.40	10K	0.060	0.300	0.050	0.004
	09	55 0012	26.4	8.0		50K	7.90	10K	0.060	0.300	0.050	0.003
	09	55 0020	21.4	11.4		50K	8.00	10K	0.080	0.400	0.070	0.002
	09	55 0060	15.3	5.4		50K	6.20	10K	0.080	0.200K	0.150	0.002
	09	55 0100	13.2	2.9		50K	6.20	10K	0.220	0.300	0.160	0.004
73/09/12	11	30 0000	27.5		168	22	6.30	10K	0.030	0.300	0.030	0.005
	11	30 0005	27.4	7.6		22	6.10	10K	0.020	0.200K	0.020	0.006
	11	30 0015	27.2	7.7		21	6.30	10K	0.020	0.200K	0.020	0.007
	11	30 0030	22.4	3.4		18	5.70	10K	0.060	0.200K	0.070	0.006
	11	30 0045	20.4	1.4		18	5.70	12	0.050	0.200K	0.100	0.006
	11	30 0065	17.8	0.2		19	5.50	10K	0.050	0.200K	0.120	0.007
	11	30 0080	17.2	0.1		24	5.70	10	0.100	0.200K	0.070	0.005
73/11/10	09	30 0000	15.6		60	20	6.30	10K	0.070	0.200K	0.030	0.012
	09	30 0010	15.6	5.6		20	6.40	10K	0.080	0.200K	0.030	0.012
	09	30 0025	15.5	7.8		20	6.50	10K	0.080	0.200K	0.030	0.014
	09	30 0050	15.5	8.0		20	6.40	10K	0.070	0.200K	0.030	0.012
	09	30 0082	15.3	8.0		20	6.30	10K	0.080	0.200K	0.040	0.006

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

130303
34 59 43.0 083 47 06.0
CHATUGE LAKE
13 GEORGIA

11EPALES 2111202
3 0105 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/30	09 55	0000	0.007	5.1
	09 55	0005	0.008	
	09 55	0012	0.012	
	09 55	0020	0.013	
	09 55	0060	0.009	
	09 55	0100	0.023	
73/09/12	11 30	0000	0.021	5.9
	11 30	0005	0.021	
	11 30	0015	0.022	
	11 30	0030	0.021	
	11 30	0045	0.021	
	11 30	0065	0.021	
	11 30	0080	0.022	
73/11/10	09 30	0000	0.014	2.9
	09 30	0010	0.012	
	09 30	0025	0.014	
	09 30	0050	0.017	
	09 30	0082	0.019	

STORET RETRIEVAL DATE 74/11/26

130304
34 58 23.0 083 46 15.0
CHATUGE LAKE
13281 GEORGIA

11EPALES 2111202
3 0083 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/29	15 20	0000	27.0		191	50K	6.90	10K	0.080	0.300	0.100	0.002K
	15 20	0012	26.7	8.8		50K	7.10	10K	0.060	0.300	0.050	0.002K
	15 20	0020	21.4	8.4		50K	6.90	10K	0.070	0.300	0.070	0.002K
	15 20	0025	19.5	6.0		50K	6.00	10K	0.060	0.200	0.120	0.002K
	15 20	0040	16.7	5.4		50K	5.90	10K	0.080	0.300	0.180	0.005
	15 20	0060	15.0	4.8		50K	5.90	10K	0.100	0.300	0.150	0.003
	15 20	0080	13.9	2.6		50K	6.20	10K	0.250	0.400	0.130	0.002K
73/09/17	14 05	0000	25.9		10A	26	6.40	10K	0.040	0.600	0.030	0.009
	14 05	0005	25.9			25	6.30	10K	0.030	0.400	0.020	0.007
	14 05	0020	25.6	7.4		24	6.20	10K	0.030	0.500	0.020	0.007
	14 05	0030	22.7	3.2		24	5.80	10K	0.080	0.400	0.070	0.006
	14 05	0045	20.7	1.2		23	5.70	10K	0.060	0.300	0.120	0.004
	14 05	0060	18.7	0.1		28	5.80	11	0.120	0.300	0.050	0.008
	14 05	0075	17.9	0.1		38	6.00	13	0.200	0.200	0.020K	0.004
73/11/10	09 50	0000	15.2		53	21	6.40	10K	0.070	0.200K	0.030	0.012
	09 50	0010	15.2	8.8		21	6.40	10K	0.060	0.200K	0.040	0.006
	09 50	0025	15.1	8.8		21	6.30	10K	0.060	0.200K	0.030	0.013
	09 50	0050	15.1	8.8		21	6.30	10K	0.070	0.200K	0.030	0.013
	09 50	0073	14.7	8.8		21	6.30	10K	0.070	0.200K	0.050	0.006

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/29	15 20	0000	0.008	4.0
	15 20	0012	0.009	
	15 20	0020	0.017	
	15 20	0025	0.015	
	15 20	0040	0.010	
	15 20	0060	0.011	
	15 20	0080	0.016	
73/09/17	14 05	0000	0.013	5.2
	14 05	0005	0.012	
	14 05	0020	0.012	
	14 05	0030	0.036	
	14 05	0045	0.065	
	14 05	0060	0.013	
	14 05	0075	0.014	
73/11/10	09 50	0000	0.014	3.9
	09 50	0010	0.014	
	09 50	0025	0.013	
	09 50	0050	0.014	
	09 50	0073	0.037	

[illegible]
[illegible]

STORET RETRIEVAL DATE 74/11/26

131305
34 5e 56.0 083 45 48.0
CHATUGE LAKE
13241 GEORGIA

11EPALES 2111202
3 0048 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/29	14 30	0000	26.9		137	50K	7.10	10K	0.060	0.500	0.040	0.002
	14 30	0010	26.7	8.0		50K	6.30	10K	0.040	0.300	0.040	0.002K
	14 30	0015	23.9	8.4		50K	6.90	10K	0.040	0.200	0.090	0.002K
	14 30	0030	19.1	8.4		50K	6.20	10K	0.050	0.200	0.090	0.002K
	14 30	0045	16.2	5.2		50K	5.10	10K	0.090	0.200	0.140	0.002K
73/09/17	14 30	0000	25.6		90	23	6.30	10K	0.040	0.500	0.020	0.005
	14 30	0005	25.5	7.8		25	6.20	10K	0.040	0.400	0.020	0.004
	14 30	0015	25.2	7.4		25	6.30	10K	0.040	0.400	0.020	0.004
	14 30	0025	23.3	5.2		24	5.90	10K	0.040	0.300	0.060	0.005
	14 30	0035	21.7	5.2		23	6.00	10K	0.080	0.300	0.080	0.004
73/11/10	11 30	0000	14.4		52	20	6.40	10K	0.050	0.200K	0.030	0.012
	11 30	0010	14.3	9.0		19	6.40	10	0.040	0.200K	0.030	0.012
	11 30	0020	14.2	8.8		18	6.20	10K	0.050	0.200K	0.040	0.007
	11 30	0036	14.0	8.6		19	6.40	10K	0.060	0.200K	0.030	0.010

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/29	14 30	0000	0.009	7.1
	14 30	0010	0.007	
	14 30	0015	0.016	
	14 30	0030	0.014	
	14 30	0045	0.019	
73/09/17	14 30	0000	0.008	5.1
	14 30	0005	0.007	
	14 30	0015	0.007	
	14 30	0025	0.011	
	14 30	0035	0.018	
73/11/10	11 30	0000	0.011	5.2
	11 30	0010	0.013	
	11 30	0020	0.010	
	11 30	0036	0.026	

STORET RETRIEVAL DATE 74/11/26

130306
34 55 29.0 083 44 00.0
CHATUGE LAKE
13281 GEORGIA

11EPALES
3

2111202
0020 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/29	11 50	0000	26.7		101	50K	6.90	10K	0.060	0.400	0.070	0.003
	11 50	0005	26.6	8.0		50K	6.90	10K	0.040	0.300	0.040	0.002
	11 50	0010	26.2	7.4		50K	6.80	10K	0.060	0.300	0.050	0.002
	11 50	0017	20.0	7.0		50K	6.60	10K	0.030	0.300	0.090	0.002K
73/09/17	14 45	0000	25.0		64	23	6.40	10K	0.040	0.300	0.030	0.006
	14 45	0005	24.1	7.4		25	6.20	10K	0.040	0.300	0.030	0.006
	14 45	0010	20.3	7.8		22	6.10	10K	0.040	0.200K	0.090	0.006
73/11/10	11 45	0000	13.5		60	19	6.50	10K	0.050	0.200	0.040	0.014
	11 45	0010	13.2	9.4		18	6.60	10K	0.050	0.200K	0.040	0.014
	11 45	0016	12.7	9.2		18	6.40	10K	0.050	0.200K	0.040	0.015

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/29	11 50	0000	0.012	2.5
	11 50	0005	0.017	
	11 50	0010	0.014	
	11 50	0017	0.070	
73/09/17	14 45	0000	0.011	4.7
	14 45	0005	0.012	
	14 45	0010	0.015	
73/11/10	11 45	0000	0.013	7.0
	11 45	0010	0.021	
	11 45	0016	0.023	

K VALUE KNOWN TO BE LESS
THAN INDICATED

APPENDIX E

TRIBUTARY DATA

Reproduced from best available copy.

STORET RETRIEVAL DATE 75/06/17

1303A1 1303A1
34 56 45.0 083 47 30.0
HOG CREEK
13201 7.5 HIAWASSEE
T/CHATUGA LAKE
SUNNYSIDE RD .5 MI W GA HWY 288
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	12 30		0.090	0.100K	0.03F	0.005	0.010
73/04/14	11 05		0.094	1.150	0.050	0.005K	0.015
73/05/12	10 45		0.070	1.150	0.038	0.005K	0.010
73/06/04	10 10		0.075	0.210	0.063	0.005K	0.010
73/07/14	10 30		0.094	0.100K	0.012	0.005K	0.015
73/08/05	11 00		0.115	0.100K	0.013	0.005K	0.015
73/09/04	11 10		0.105	0.180	0.034	0.009	0.020
73/10/06	10 50		0.094	0.100K	0.042	0.005K	0.050
73/11/10	10 45		0.110	0.250	0.013	0.005K	0.005K
73/12/08	11 10		0.132	0.100K	0.012	0.005K	0.040
74/01/05	12 10		0.125	0.100K	0.015	0.005K	0.010
74/01/19	10 30		0.112	0.100K	0.015	0.005K	0.005
74/02/02	12 00		0.104	0.600	0.015	0.005K	0.090
74/02/15	11 32		0.144	0.700	0.045	0.010	0.090

STORET RETRIEVAL DATE 75/06/17

130381 130381
34 55 30.0 083 44 00.0
HIAWASSEE RIVER
13 7.5 MACEDONIA
I/CHATUGA LAKE
ST HWY 17 & 75 BRDG 1 MI E JCT US 76
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	11 30		0.066	0.750	0.052	0.007	0.010
73/04/14	10 35		0.063	1.260	0.065	0.005K	0.015
73/05/12	09 40		0.052	0.580	0.034	0.005K	0.010
73/06/09	09 25		0.054	0.720	0.230	0.005K	0.010
73/07/14	09 50		0.068	0.400	0.198	0.005K	0.025
73/08/05	10 20		0.062	0.100K	0.009	0.005K	0.015
73/09/09	10 20		0.045	0.250	0.027	0.008	0.020
73/10/06	10 00		0.062	0.400	0.034	0.006	0.045
73/11/10	10 00		0.042	0.350	0.017	0.006	0.010
73/12/08	13 00		0.056	0.200	0.036	0.005K	0.050
74/01/05	11 30		0.092	0.300	0.020	0.005K	0.015
74/01/19	09 35		0.084	0.100K	0.035	0.005K	0.015
74/02/02	10 50		0.096	1.400	0.030	0.015	
74/02/16	10 40		0.069	0.300	0.020	0.005	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/06/17

```
 130362          37X282
35 02 00.0 083 47 30.0
NANTAHALA RIVER (NC)
13      CLAY CTY HWY MAP
U/CHATUGA LAKE
HWY BRDG JUST BELO DAM
11EPALES                2111204
4                       0000 FEET   DEPTH
```

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	14	15	0.134	0.500	0.031	0.005K	0.005K
73/04/14	15	10	0.147		0.220	0.005K	0.015
73/05/12	12	35	0.147	0.630	0.044	0.005K	0.005K
73/06/09	11	10	0.154	0.740	0.050	0.005K	0.005K
73/07/14	11	30	0.110	0.260	0.120	0.005K	0.035
73/08/05	13	35	0.210	0.170	0.046	0.005K	0.050
73/09/04	14	00	0.115	0.350	0.048	0.005K	0.015
73/10/06	12	45	0.051	0.200	0.084	0.005K	0.040
73/11/10	13	15	0.024	0.450	0.046	0.005K	
73/12/08	10	25	0.084	0.100K	0.008	0.005K	0.050
74/01/05	14	05	0.088	0.100K	0.035	0.005K	0.010
74/01/19	11	00	0.050	0.200	0.035	0.005K	0.010
74/02/02	14	30	0.123	0.900	0.110	0.005K	0.010
74/02/16	13	40	0.165	0.300	0.030	0.005	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/06/17

1303C1 1303C1
34 55 30.0 083 44 30.0
FODDER CREEK
13 7.5 MACEDONIA
T/CHATUGA LAKE
BRDG ON FODDER CREEK RD
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	12 00		0.072	0.620	0.048	0.005K	0.005K
73/04/14	10 45		0.056	0.850	0.087	0.005K	0.010
73/05/12	10 15		0.050	0.580	0.083	0.005K	0.010
73/06/09	09 50		0.063	0.810	0.340	0.005K	0.010
73/07/14	10 16		0.075	0.170	0.024	0.009	0.030
73/08/05	10 50		0.069	0.100K	0.012	0.005K	0.015
73/09/09	11 00		0.056	0.260	0.021	0.005K	0.015
73/10/06	10 30		0.050	0.200	0.025	0.005K	0.045
73/11/10	10 30		0.048	0.200	0.024	0.014	0.030
73/12/08	10 55		0.080	0.100K	0.008	0.005K	0.010
74/01/05	11 55		0.112	0.100K	0.015	0.005K	0.010
74/01/19	10 00		0.060	0.100	0.010	0.005K	0.010
74/02/02	11 40		0.120	1.100	0.085	0.005	
74/02/16	11 10		0.112	0.200	0.010	0.010	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/06/17

130301 3/X201
35 01 30.0 083 43 00.0
SHOOTING CREE (NC)
13 CLAY CTY HWY MAP
T/CHATUGA LAKE
US 64 BRDG BELO CONFLU ROCKING CHAIR BR
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	14 50		0.160	0.460	0.050	0.005K	0.010
73/04/14	14 45		0.160	1.300	0.105	0.005K	0.010
73/05/12	13 00		0.125	0.500	0.038	0.005K	0.015
73/06/09	10 45		0.180	0.880	0.220	0.005K	0.010
73/07/14	11 10		0.138	0.100K	0.011	0.005K	0.020
73/08/05	13 35		0.150	0.100K	0.014	0.005K	0.010
73/09/09	13 00		0.115	0.260	0.012	0.006	0.010
73/10/05	12 20		0.120	0.350	0.022	0.005K	0.035
73/11/16	12 50		0.138	0.400	0.018	0.005K	0.040
73/12/06	12 45		0.240	1.500	0.040	0.005K	0.060
74/01/05	13 45		0.232	0.100K	0.015	0.005K	0.015
74/01/19	10 15		0.208	0.100K	0.020	0.010	0.015
74/02/02	13 50		0.264	1.200	0.065	0.005K	0.075
74/02/16	13 20		0.232	0.300	0.055	0.010	0.080

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/06/17

1303E1 1303E1
34 58 30.0 083 44 00.0
BELL CREEK
13 7.5 MACEDONIA
T/CHATUGA LAKE
BANK JUST ABOV MOUTH .25 ABOV RT 75 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	16 00		0.140	1.200	0.058	0.007	0.015
73/04/14	11 30		0.120	0.930	0.042	0.005K	0.015
73/05/12	11 10		0.096	0.480	0.058	0.005K	0.020
73/06/09	10 30		0.115	2.000	0.189	0.005K	0.010
73/07/14	10 50		0.100	0.180	0.015	0.006	0.030
73/08/05	11 25		0.132	0.100K	0.019	0.005K	0.030
73/09/09	12 00		0.105	0.300	0.021	0.006	0.025
73/10/06	11 15		0.170	0.250	0.025	0.005K	0.050
73/11/10	11 15		0.138	0.500	0.025	0.005K	0.017
73/12/08	12 15		0.224	0.100	0.014	0.005K	0.050
74/01/05	13 30		0.240	0.100K	0.015	0.005K	0.015
74/01/19	10 50		0.160	0.100K	0.015	0.005	0.015
74/02/02	13 30		0.240	0.800	0.050	0.010	0.065
74/02/16	13 00		0.200	0.400	0.020	0.020	0.110

K VALUE KNOWN TO BE
LESS THAN INDICATED

Reproduced from
best available copy.

STORET RETRIEVAL DATE 75/06/17

1303F1 1303F1
34 55 30.0 085 41 30.0
NICKAJACK CREEK
13 7.5 MACEDONIA
TENNESSEE
BANK 2 MI E OF JCT ST HWY 17 AND US 76
HAMILTON 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/10	16	30	0.147	0.780	0.260	0.006	0.015
73/04/14	10	20	0.120	0.240	0.054	0.005K	0.012
73/05/12	09	55	0.125	1.320	0.090	0.005K	0.015
73/07/14	13	40	0.120	0.100K	0.016	0.005K	0.022
73/08/05	10	35	0.147	0.120	0.009	0.005K	0.045
73/09/09	10	40	0.150	0.330	0.025	0.007	0.030
73/10/08	10	20	0.130	0.100K	0.028	0.009	0.045
73/11/10	10	15	0.126	0.125	0.016	0.005K	0.025
73/12/08	10	40	0.216	0.100K	0.008	0.005K	0.045
74/01/05	11	45	0.224	0.100K	0.010	0.005K	0.020
74/01/19	09	15	0.160	0.100K	0.020	0.005K	0.015
74/02/02	11	20	0.232	1.700	0.050	0.015	
74/02/16	10	55	0.176	0.300	0.020	0.010	0.100

K VALUE KNOWN TO BE
LESS THAN INDICATED